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Indian Standard

ELECTROTECHNICAL VOCABULARY

PART XVIII GENERAL TERMS ON RADIO-COMMUNICATIONS

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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PART XVIII GENERAL TERMS ON RADIO-COMMUNICATIONS

(First Reprint AUGUST 1970)

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Indian Standard

ELECTROTECHNICAL VOCABULARY

PART XVIII GENERAL TERMS ON RADIO-COMMUNICATIONS

0. FOREWORD

0.1 This Indian Standard (Part XVIII) was adopted by the Indian Standards Institution on 26 October 1967, after the draft finalized by the Electrotechnical Standards Sectional Committee in consultation with the Electronic Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 A series of standards has been prepared with a view to bringing together the terms relating to radiocommunications covering different aspects, such as circuits, radiowave propagation, aerials, transmitting and receiving equipment, radio telegraphy and mobile radio, sound and television broadcasting, radio-location and radio-navigation, etc. This standard deals with general terms on radiocommunications.

0.3 The definitions contained in this standard have been drawn up with the object of striking a correct balance between absolute precision and simplicity. The principal object of the standard is to provide definitions which are sufficiently clear so that each term is understood with the same meaning by all electrical engineers and it does not, therefore, constitute a treatise on electrical engineering. Thus, it may sometimes be felt that the definitions are not sufficiently precise, do not include all cases, do not take account of certain exceptions or are not identical with those which may be found in other publications designed with other objects and for other readers. Such imperfections, which will be eliminated as far as possible in later editions, are inevitable and should be accepted in the interest of simplicity and clarity.

0.4 This standard is one of a series of Indian Standards on electrotechnical vocabulary.

0.5 This standard largely follows IEC Draft Publication 50(60), Group 60 'Radio communications' brought out by International Electrotechnical Commission. Assistance has also been derived from B.S. 204 : 1960 'Glossary of terms used in telecommunication (including radio) and electronics' issued by the British Standards Institution.

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1. SCOPE

1.1 This standard (Part XVIII) covers definitions of general terms used in the field of radiocommunications.

2. BASIC TERMS

2.1 Radio — A general term applied to the use of radio waves.

2.2 Radiocommunication — Telecommunication by means of radio waves.

2.3 Radio-Telephony — Telephony by means of radio waves.

2.4 Radio-Telegraphy — Telegraphy by means of radio waves.

2.5 Radio-Broadcasting — Transmissions, by radio, of a programme for general reception.

NOTE — These transmissions may include sound transmissions, television transmissions or other types of transmissions.

2.6 Radio Link — A radiocommunication system, generally two-way, forming part of a telecommunication circuit.

2.7 Radio Relay — The retransmission of signals over succession of radio links.

2.8 Radio Relay Station — A radio station receiving and retransmitting radio signals carrying the same information.

2.9 Radio Relay System — A radio circuit comprising terminal stations connected by intermediate radio relay stations.

2.10 Wideband Radio Relay System — A system of transmitting a band of frequencies which can accommodate one or more groups of telephone or television signals, or combinations of these two or any other type of signal requiring bandwidths of this order, by means of radio normally in one or more intermediate stations.

2.11 Radio Telemetry/Radio Telemetering — The use of radiocommunication for automatically indicating or recording measurements at a distance from the measuring instrument.

2.12 Single-Frequency Operation — A radio system in which the transmitted frequency is the same for both directions of transmission.

2.13 Two-Frequency Operation — A radio system in which the transmitted frequency is different for the two directions of transmission.

2.14 Reversed-Frequency Operation — A method of operation of a two-frequency system in which one station communicates with other stations by relaying through the base station, the frequency allocation for transmitting and receiving at the first mentioned station being the reverse of the allocation at the base station, that is, the same as at each of the other stations.

2.15 Talk-Through Facility — An arrangement of a two-frequency system whereby radio stations communicate with one another via a base station or a third station.

2.16 Selective Calling — A system whereby the transmission of a single code from a station enables another predetermined station or group of stations to be called exclusively.

2.17 Spaced Carrier Operation — A method of operation whereby two or more separated stations transmit (and receive) the same signals simultaneously on two or more carrier frequencies spaced by a small frequency interval, in order to extend the area effectively covered by the service.

2.18 Simplex Operation — The method of operation whereby transmission is made possible alternately in each direction, for example, by means of a manual control.

NOTE — Simplex operation may use either one or two frequencies in radiocommunication.

2.19 Duplex Operation — A method of operation whereby transmission is made possible simultaneously in both directions.

NOTE — Duplex operation requires two frequencies in radiocommunication.

3. ELECTROMAGNETIC WAVES AND CLASSIFICATION OF RADIO WAVES

3.1 Electromagnetic Waves — The waves which occur in the natural process by which electric and magnetic effects are propagated. Electromagnetic waves are known as Hertzian waves, infra-red rays, light rays, ultra-violet rays, x-rays, etc, depending on their frequencies.

3.2 Radiation (in Radio) — The emission or transmission of energy in the form of radio waves.

3.3 Radio Waves (Hertzian Waves) — Electromagnetic waves of frequencies lower than 3000 Gc/s in free space without artificial guide.

3.4 Radio Frequency — A frequency at which the coherent electromagnetic radiation of energy is useful for communication purposes.

3.5 Wavelength — The distance between corresponding points in consecutive waves in a wave-train, measured in the direction of propagation at any instant.

3.6 Attenuation — The reduction in current, voltage or power along the transmission path of a signal when transmitted through a network, along a line or waveguide, or by radio propagation [*see also* **4.1** of IS: 1885 (Part I)-1961*].

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*Electrotechnical vocabulary: Part I Fundamental definitions.

3.7 Classification of Radio Frequencies and Wavelengths* — The radiospectrum is subdivided into nine frequency bands designated by progressive whole number in accordance with Table 1.

The frequencies should be expressed in:

a) kilocycles per second (kc/s) up to and including 3 000 kc/s;

b) megacycles per second (Mc/s) thereafter, up to and including 3 000 Mc/s; and

c) gigacycles per second (Gc/s) thereafter, up to and including 3 000 Gc/s.

However, where adherence to these provisions would introduce serious difficulties, for example, in connection with the notification and registration of frequencies, the lists of frequencies and related matters, reasonable departures may be made.

TABLE 1 CLASSIFICATION OF RADIO FREQUENCIES

BAND NUMBER	FREQUENCY RANGE (LOWER LIMIT EXCLUSIVE, UPPER LIMIT INCLUSIVE)	CORRESPONDING METRIC SUBDIVISION
4	3 to 30 kc/s	Myriametric waves
5	30 „ 300 kc/s	Kilometric waves
6	300 „ 3 300 kc/s	Hectometric waves
7	3 „ 30 Mc/s	Decametric waves
8	30 „ 300 M/cs	Metric waves
9	300 „ 3 000 Mc/s	Decimetric waves
10	3 „ 30 Gc/s	Centimetric waves
11	30 „ 300 Gc/s	Millimetric waves
12	300 „ 3 000 Gc/s *or* 3 Tc/s	Decimillimetric waves

NOTE 1 — 'Band Number N' extends from 0.3 × 10^N to 3 × 10^N c/s.

NOTE 2 — Abbreviations:

c/s = cycles per second;

k = Kilo (10^3); M = Mega (10^6);

G = Giga (10^9); and T = Tera (10^{12}).

NOTE 3 — Abbreviations for adjectival band designations:

Band 4 = VLF (Very low frequency)

Band 5 = LF (Low frequency)

Band 6 = MF (Medium frequency)

Band 7 = HF (High frequency)

Band 8 = VHF (Very high frequency)

Band 9 = UHF (Ultra high frequency)

Band 10 = SHF (Super high frequency)

Band 11 = EHF (Extra high frequency)

3.8 Microwaves — Electromagnetic waves of sufficiently high frequency that practical use can be made of waveguide and associated cavity techniques in their transmission and reception.

NOTE — The lower frequency limit is approximately 1 000 Mc/s.

3.9 Frequency Band

a) A group of frequencies for which the oscillations or the waves have comparable properties.

Examples:

' Acoustic band ' and ' Radio band '

b) The frequency range within which an equipment can be adjusted to operate.

NOTE — The frequency range of an equipment may be subdivided.

3.10 Service Band — A band of frequencies accommodating one or more channels allocated to a given class of radiocommunication service.

3.11 Channel — A part of radio frequency band used for a given class of radiocommunication service.

4. OSCILLATIONS AND SIGNALS

4.1 Oscillatory Circuit — A circuit posssessing capacitance, inductance and resistance but in which the reactive elements clearly predominate over the resistance. The distinction is made between a series oscillatory circuit and a parallel oscillatory circuit depending whether the capacitance and inductance are coupled in series or in parallel.

4.2 Damped Oscillations — Oscillations, the amplitudes of which progressively decrease with respect to time.

4.3 Logarithmic Decrement of Damped Oscillations — The naperian logarithm of the ratio between the amplitude of succcessive oscillations of the same sign [*see also* **4.12** of IS : 1885 (Part I)-1961*].

4.4 Natural Frequency — One of the frequencies of free oscillation of system.

4.5 Combination Frequency/Combination Tone — A frequency introduced as a result of interaction between oscillations at two or more frequencies applied to a non-linear circuit.

4.6 Wave — A modification of the physical state of a medium which is propagated as a result of a local disturbance [*see also* **4.28** of IS : 1885 (Part I)-1961*].

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*Electrotechnical vocabulary: Part I Fundamental definitions.

4.7 Standing Wave — A state of vibration in which oscillatory phenomenon at all points are governed by the same time function with the exception of a numerical factor, varying from one point to another.

4.8 Stationary Wave — A standing wave in which the net energy flux is zero at all points.

4.9 Standing Wave Ratio — In a standing wave the ratio of the difference between the maximum and minimum amplitude to the sum of the maximum and minimum amplitudes.

4.10 Node of Standing Wave — Any point, line or surface in a distributed field, for example, in a waveguide or transmission line, at which some specified variable (voltage, current, electric or magnetic field) attains a zero or near zero magnitude [*see also* **5.25** of IS: 1885 (Part III/Sec I)-1965*].

4.11 Antinode of a Standing Wave — Any point, line or surface in a distributed field, for example, in a waveguide or transmission line, at which some specified variable attains a maximum magnitude [*see also* **5.27** of IS: 1885 (Part III/Sec I)-1965*].

4.12 Signal — A time varying phenomenon containing or conveying information [*see also* **2.5** of IS: 1885 (Part III/Sec I)-1965*]

4.13 Overshoot — Transient exaggeration of the magnitude of the leading or trailing edge of a steep-sided signal.

NOTE — The term 'undershoot' is often applied to an initial response which at its first turning point fails to reach the steady-state value.

The term 'undershoot' is also some times applied to an excursion in a direction opposite to that of the main transition.

4.14 Response — The output signal resulting from a given signal applied to the input terminals of a network.

4.15 Amplitude *vs* Frequency Response/Response *vs* Frequency Characteristic — The amplitude of the output signal as a function of frequency, for a sinusoidal input signal of constant magnitude.

4.16 Amplitude *vs* Amplitude Characteristic — The amplitude of the output signal as a function of the amplitude of the input signal for a sinusoidal input signal of constant frequency.

4.17 Step-Function Response/Indicial Response — The amplitude of the output as a function as of time when the input signal is a step-function.

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*Electrotechnical Vocabulary: Part III Acoustics, Section 1 Physical acoustics.

4.18 Delta-Function Response — The response when the input signal is a Dirac function.

4.19 Shock Excitation — The excitation of natural oscillations in an oscillatory system due to a sudden acquisition of energy from an external source.

4.20 Distortion — The presence of undesired components of amplitude of frequency or phase in the output signal compared to the input signal.

4.21 Amplitude Distortion — A type of distortion in an amplifier or other device when the amplitude of the output is not exactly a linear function of the input amplitude.

4.22 Frequency Distortion — Distortion due to underived amplitude frequency characteristics.

5. CARRIER MODULATION

5.1 Carrier Wave/Carrier

a) The wave which is intended to be modulated.

b) In a modulated wave, the carrier-frequency spectral component.

5.2 Carrier Frequency — The frequency of the wave which is intended to be modulated.

5.3 Modulating Wave — A wave which causes a variation of some characteristic of the carrier.

5.4 Modulated Wave — A wave, some characteristic of which varies in accordance with the value of a modulating wave.

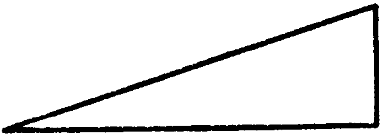
5·5 Sideband — The frequency band at either the upper or lower side of a carrier frequency within which fall the spectral components produced by the process of modulation.

Note — The terms 'upper sideband' or 'lower sideband' are used to denote the ranges higher than or lower than the carrier frequency respectively.

5.5.1 *Side Frequency* — A single frequency in a sideband.

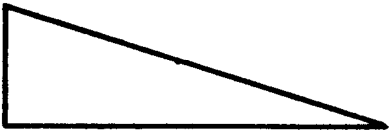
5.5.2 *Erect Sideband* — Group in which channel sidebands are erect (group frequency increases with increasing modulating frequency).

Symbolic representation —



5.5.3 *Invert Sideband* — Group in which channel sidebands are inverted (group frequency increases with decreasing modulating frequency).

Symbolic representation —



5.6 Baseband — The band of frequencies which are modulated into the carrier of a wideband radio relay system.

5.7 Double Sideband Transmission — The method of operation in which both sidebands produced by the process of modulation are transmitted equally.

5.8 Single Sideband Transmission — A method of operation in which either the upper or lower sideband (as produced by the process of modulation) is transmitted.

NOTE — In practice, the carrier is either partially or wholly suppressed

5.9 Independent Sideband Transmission — A method operation in which each sideband corresponds to one or more modulating signals independent of the modulating signal(s) for the other sideband.

NOTE — In practice, tho carrier is either partially or wholly suppressed.

5.10 Reduced Carrier Transmission — An amplitude modulated transmission in which the level of the carrier is reduced in comparison with than necessary to ensure a correct reconstitution of the modulating signal (without distortion) by means of a linear detector.

5.11 Pilot Carrier — A low-level signal at carrier frequency transmitted for receiver control purposes, for example, tuning control and automatic gain control. It may also be used at the receiver, after reconditioning, for transmission medium indication at received end or demodulating purposes.

5.12 Carrier Compression — An unwanted change in the amplitude of the pilot carrier of a single sideband or independent sideband transmitter which occurs when a sideband signal is present. The change, whether an increase or a decrease, is commonly referred to as ‘ compression ’.

5.13 Vestigial Sideband — A sideband containing only components corresponding to the lower frequencies of the modulating signal.

5.14 Vestigial Sideband Transmission — A system of transmission in which one complete sideband and its complementary vestigial sideband are utilized.

5.15 Guard Band — A narrow frequency band left vacant between two channels to give a margin of safety against mutual interference.

5.16 Amplitude Modulation — Modulation in which the amplitude of a carrier is the characteristic varied.

5.17 Frequency Modulation — Angle modulation of a sine wave carrier in which the instantaneous frequency of the modulated wave differs from the carrier frequency by an amount proportional to the instantaneous amplitude of the modulating wave.

5.18 Carrier Leak — The presence of unwanted carrier in the transmission path of a suppressed carrier amplitude modulated system.

6. NOISE AND INTERFERENCE

6.1 Atmospheric Noise — Radio noise produced by natural electrical discharges below the ionosphere and reaching the receiver along the normal propagation paths between the earth and the lower limit of ionosphere.

6.2 Atmospheric — An isolated element of atmospheric noise.

6.3 Extra-Terrestrial Noise — Noise arising from natural phenomena outside the atmosphere.

6.4 Man-Made Noise — Noise having its source in electrical apparatus or machines.

6.5 Intermodulation Noise — Noise due to intermodulation as a result of interaction between frequencies of a signal applied to a non-linear circuit.

6.6 Interference — Disturbance experienced in the reception of a wanted signal, caused by an unwanted signal or noise.

6.7 Interfering Transmitter — A transmitter producing an unwanted signal and giving rise to interference.

6.8 Precipitation Static Interference — Noise produced in airborne radio equipment by the dissipation of static charge from the aircraft to the atmosphere.

6.9 External Selection Interference — An electromagnetic phenomenon, usually abrupt and random, sometimes of a periodic character, unrelated to any signal, which is superposed on the useful signal at some point in the transmission channel.

6.10 Jamming — Deliberate interference, due to unwanted signals, which is intended to render unintelligible the whole or part of the desired signal.

6.11 Anti-Jamming (AJ in Radar) — Reducing the effects of jamming.

6.12 Jammer — A transmitter for producing a jamming signal.

6.13 Adjacent Channel Interference — Interference in which the extraneous power originates from a signal of assigned type in an adjacent channel.

6.14 Cross Talk — Electrical disturbances in a communication channel as a result of coupling with other communication channels.

6.15 Signal-to-Noise Ratio or Signal/Noise Ratio — At a specified point and pre-specified condition. The ratio of the power of the wanted signal to that of the co-existent noise.

NOTE 1 — The co-existent noise may differ from the noise when the input is reduced to zero.

NOTE 2 — In practice, it is signal-plus-noise to noise-ratio.

NOTE 3 — The ratio is often expressed in decibels.

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Note — This index has been prepared in accordance with IS : 1275-1958*. Index numbers are clause numbers.

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